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ANNOTATED LIST OF ODONATA FROM MAINIT HOT SPRING PROTECTED LANDSCAPE, COMPOSTELA VALLEY, MINDANAO ISLAND, PHILIPPINES

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ABSTRACT

Within the framework of the 'Rapid Biodiversity Survey of Mainit Hot Spring Protected Landscape' conducted by the Research and Development Centre of Assumption College of Nabunturan, an annotated list of Odonata was compiled, representing 41 species in 25 genera and 12 families from seven sites surveyed from December 2011 to February 2012. These records represent the baseline data for Mainit Hot Spring Protected Landscape and even for Compostela Valley Province. One species is potentially new to science; more than half of the records are forest dwelling endemics.

KEYWORDS: *Baseline data, endemic species, conservation.*

INTRODUCTION

Odonata are an important indicator of habitat integrity (Butler & de Maynadier, 2008; Clark & Samways, 1996; Foote & Hornung, 2005; Jonsen & Taylor, 2000), useful for monitoring and evaluating effects of human disturbance and success of conservation efforts. The conspicuous nature of the group and the relative familiarity of the public has an advantage to other indicator species that is very inconspicuous and sometimes requiring stereomicroscope to examine.

The Philippine archipelago (Fig. 1) has nearly 300 Odonata species with the island of Mindanao having about 130 of those species (Hamalainen & Muller, 1997). Despite our fair knowledge of Mindanao's Odonata fauna, new species are still regularly found (Villanueva, 2011), particularly from poorly explored regions. Compostella Valley Province is one region where information on Odonata diversity is very poor. Its main protected area, Mainit Hotsprings Protected Landscape [N 7°30'00", E 125°59'00"], has no single record of Odonata.

Mainit Hotsprings Protected Landscape is an important biodiversity reserve in Compostela Valley. It comprises 1,374 ha of protected land and 401 ha of buffer zone. It was proclaimed a protected area as Mainit Hotsprings Protected Landscape (MHSPL) on 31st of May 2000 through the Proclamation Number 320. MHSPL was originally declared by the municipality of Nabunturan as Mainit Hotsprings National Park. The landscape features magnificent series of hot springs, rock formations, waterfalls from its different creeks, and cold springs. Because of its uniqueness and featured characteristics, it ushered economic development through eco-tourism in Compostela Valley Province.

The discovery of mining potential within the park in the late 1990's caused many species of flora and fauna to be disturbed and threatened. Rampant timber cutting, particularly the hardwoods (Dipterocarpaceae), has led to massive habitat destruction and disturbance numerous species of plants and animals. Presently, MHSPL faces an alarming threat to its biodiversity from such unregulated activities as illegal entry/occupancy, timber harvesting, small-scale mining activities, and conversion of park areas for agricultural purposes (Philippine Clearing House Mechanism for Biodiversity, n.d.).

The variety of socio-political issues affecting the park has caused detrimental threats to its floral and faunal assemblages. Moreover, since its proclamation as a protected landscape in 2000, no biodiversity studies have ever been conducted. Thus, the Research and Development Centre of Assumption College of Nabunturan (ACN) in collaboration with other local agencies pioneered a biodiversity assessment within the park. The present paper is one of the results of the Rapid Biodiversity Survey of Mainit Hotsprings Protected Landscape.

MATERIALS AND METHODS

Opportunistic sampling of every potential habitat including creeks, several minute tributaries, hot springs, falls, and rivers was carried out. We surveyed seven (7) sites within the MHSPL, Nabunturan, Compostela Valley Province, Philippines (Fig. 1) between the months of December 2011 and Febrauary 2012. The identified sites included hot springs in Barangay Bukal, Sitio New Bohol, Sitio Pagtulian, Saraban 1 & 2, Sitio Matagdungan, and Tindalo (Fig. 2).

Hand picking was primarily used to catch zygopterans. An insect net was sometimes used to catch elusive species. Voucher specimens were collected and treated with acetone prior to drying. Specimens were stored in ACN reference collection and the third author's private collection. Voucher specimens have also been deposited at the Entomology Section of the National Museum of the Philippines and are awaiting the assignment of accession numbers.

RESULTS

Forty-one species belonging to 12 families and 26 genera with 27 species endemic to the country were identified (Fig. 3) categorized into 17 anisopterans and 24 zygopterans. These records represent the first for MHSPL and even for Compostela Valley Province. One species is potentially new to science.

Annotated lists of species:

[distribution of species (O: Oriental, P: Philippine, GM: Greater Mindanao, M: Mindanao, EM: Eastern Mindanao, CT: Circumtropical)]

Amphipterygidae

1. *Devadatta podolestoides basilanensis* Laidlaw, 1934 [GM]

Calopterygidae

2. *Vestalis melania* Selys, 1873 [P]

Chlorocyphidae

3. *Cyrano angustior* Hamalainen, 1989 [GM]
4. *Rhinocypha colorata* (Hagen *in* Selys, 1869) [P]
5. *Rhinocypha turconii* Selys, 1891 [P]
   This species is more sensitive to habitat disturbance that its congener. It is primarily found in undisturbed areas.

Coenagrionidae

6. *Agriocnemis f. femina* (Braeur, 1868) [O]
7. *Amphicnemis cantuga* Needham & Gyger, 1939 [M]
8. *Ceriagrion lieftincki* Asahina, 1967 [P]
9. *Pseudagrion p. pilidorsum* (Brauer, 1868) [O]
10. *Teinobasis annamaijae* Hamalainen & Muller, 1989 [M]
11. *Teinobasis samaritis* Ris, 1915 [P]
    The genus *Teinobasis* is a characteristic element of Philippine streams, especially those with slow moving water and slightly muddy substrate. It is interesting to note that the area is depauperate of *Teinobasis* despite a number of suitable habitats.

Euphaeidae

12. *Euphaea amphicyana* Ris, 1930 [GM]

Platycnemididae

13. *Coeliccia dinocerus* Laidlaw, 1925 [GM]
14. *Risiocnemis appendiculata* (Brauer, 1868) [GM]
15. *Risiocnemis erythrura* (Brauer, 1868) [M]
16. *Risiocnemis atripes* Needham & Gyger, 1941 [M]
17. *Risiocnemis flammea* Selys, 1882 [GM]

18. *Risiocnemis fuligifrons* Hamalainen 1991 [GM]
19. *Risiocnemis tendipes* Needham & Gyger, 1941 [M]

Platystictidae

20. *Drepanosticta lestoides* (Brauer, 1868) [GM]
21. *Drepanosticta lymetta* Cowley, 1936 [EM]

    The type locality of this species is "Surigao". van Tol (2005) commented "*Drepanosticta* material from this area (Surigao) is not well represented. The differences may prove sufficient to distinguish more than one taxon in due time. The authors refrained from naming these forms awaiting further material from Surigao". The third author has acquired a series of material from Surigao del Norte that fits the description of *D. lymetta*. It is distinct from the materials collected in MHSPL suggesting a potentially new taxon. Following van Tol (2005), the authors temporarily refrained from working on the present material until enough samples from various parts of eastern Mindanao become available for study.
22. *Drepanosticta krios* van Tol 2005 [M plus Sulu region]
23. *Drepanosticta flavomaculata* van Tol 2005 [GM]

Protoneuridae

24. *Prodasineura integra* (Selys, 1882) [P]

Aeshnidae

25. *Gynacantha subinterrupta* Rambur, 1842 [O]

Corduliidae

26. *Idionyx philippa* Ris, 1912 [P]

    This species was sighted on 21.i.2012. The individual was seen flying in a deep and shaded ravine.
27. *Heteronaias heterodoxa* Needham & Gyger, 1937 [P]

Gomphidae

28. *Heliogomphus* sp. (cf. *bakeri*) [P]

    This species was sighted on 21.i.2012.

Libellulidae

29. *Agrionoptera insignis* (Rambur, 1842) [O]
30. *Diplacodes trivialis* Rambur, 1842 [O]
31. *Diplacina bolivari* Selys, 1882 [P]
32. *Diplacina braueri* Selys, 1882 [P]
33. *Diplacina* sp. [P]

    This third *Diplacina* species was photographed on 21.xii.2011. The distinct interrupted antehumeral stripe suggests either *D. nana* (Brauer, 1868) or *D. lisa* (Needham & Gyger, 1941.
34. *Neurothemis r. ramburii* (Brauer, 1866) [O]
35. *Neurothemis t. terminata* Ris, 1911 [O]
36. *Orthetrum pruinosum clelia* (Selys, 1878) [O]

37. *Orthetrum s. sabina* (Drury, 1770) [O]
38. *Orthetrum t. testaceum* (Burmeister, 1839) [O]
39. *Pantala flavescens* Fabricius, 1798 [CT]
40. *Trithemis festiva* Rambur, 1842 [O]
41. *Zyxomma obtusum* Albarda, 1881 [O]

DISCUSSION

The present list represents the first Odonata data from any protected area in Mindanao and only the second in the country (Ramos and Gapud, 2007). The discovery of one potentially new species clearly emphasizes the need to conduct more odonatological surveys while remaining intact riverine habitats still exist. Oppel (2006) showed that there is difference in the Odonata diversity between disturbed and undisturbed sites. Undisturbed sites mainly host endemic species. There are several remaining sites which do not have enough biodiversity data to this day and are expected to host undocumented and possibly new species.

The Odonata assemblage in the MHSPL shows a predominance of forest dwelling zygopterans. Sixty-seven percent of the listed Odonata in the MHSPL are endemic to the Philippines. This number is higher compared to some islands like the Babuyan and Batanes Islands having 54.55% (Villanueva, 2009), or in Diomabok Lake, eastern Mindanao 51% (Villanueva, 2011) endemicity. The remarkably high rate of endemics has strong conservation implications particularly in Compostela Valley Province where MHSPL is the main protected area. It clearly shows that conservation measures should be implemented in the area to conserve these endemic species that is sensitive to habitat changes.

It is unfortunate though that this biologically rich area is facing grave threats from human activities (Allan, 2004; Subramanian, et. al., 2005; Tarras-Wahlberg, et. al., 2001). It became evident during the survey that a huge part of the protected area has been intruded by the locals. Slash and burn farming destroyed the steepest slopes and the streams and rivers are silted by mine tailings as observed by the color of the water. Trees have been cut down to support the foundation and wall of the mines leaving the land empty for erosion.

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van Tol, J. 2005. Revision of the Platystictidae of the Philippines (Odonata), excluding the *Drepanosticta halterata*-group, with description of twenty-one new species. *Zoologische Mededelingen*, 79: 195-282.

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Villanueva, R.J.T., 2011. Odonata fauna of Diomabok Lake and its surroundings, Davao Oriental, Mindanao Island, Philippines. International Dragonfly Fund- Report, 38: 1-29.

FIGURES AND CAPTIONS

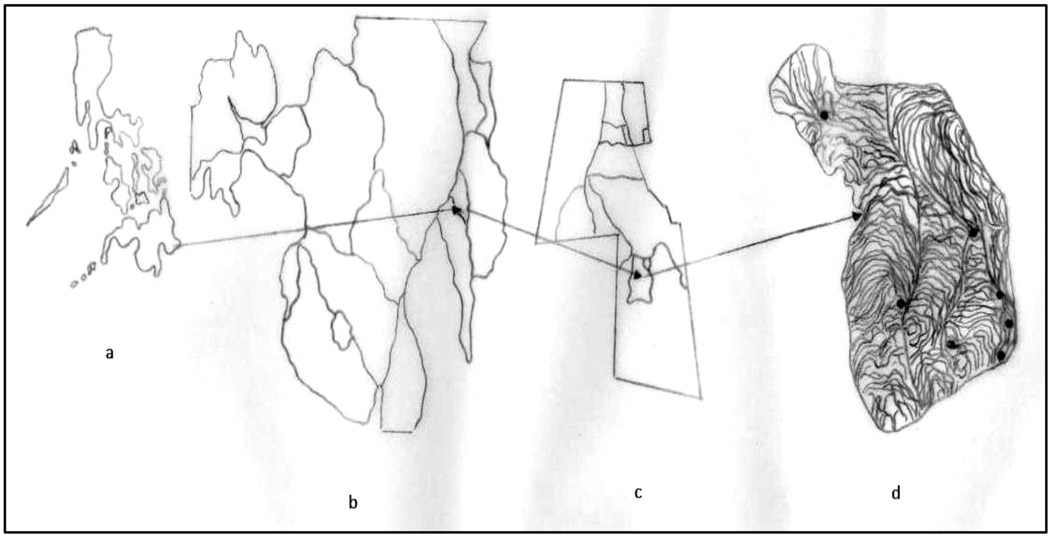


Figure 1. Line map of the Philippines (a); Map of Mindanao (b); Map of Municipality of Nabunturan, Compostela Valley, Philippines (c); Map of the study area- Mainit Hot Spring Protected Landscape, Nabunturan, Compostela Valley, Philippines and survey sites (in dots) (d).

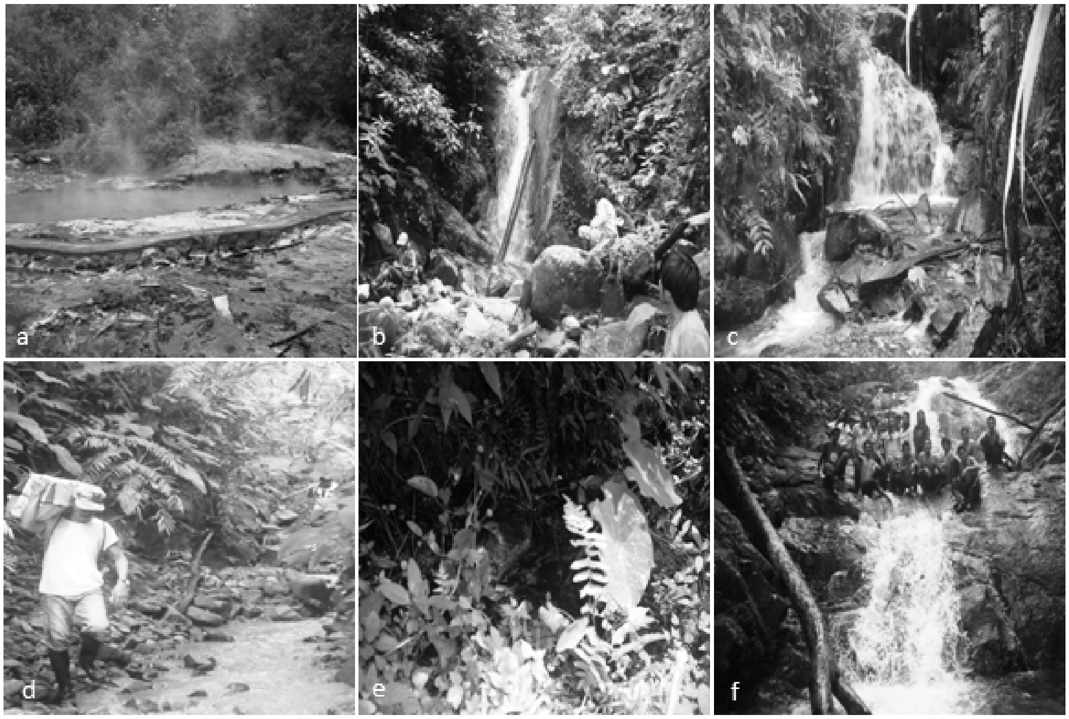


Figure 2. Survey sites in MHSPL: Hot springs in Barangay Bukal (a), Sitio New Bohol (b), Sitio Matagdungan (c), Saraban 2 (d), Sitio Pagtulian (e), and Sitio Tindalo (f).

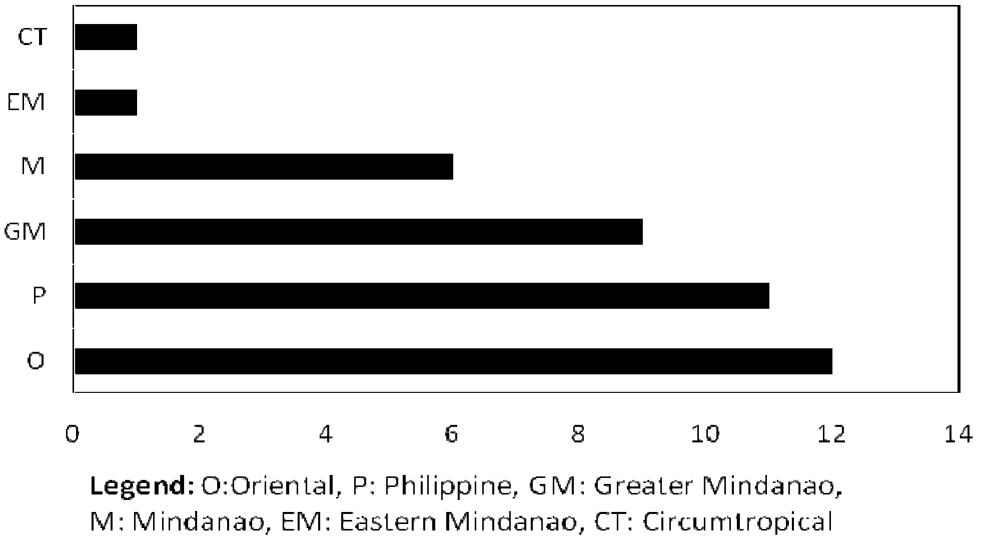


Figure 3. Geographic distribution of Odonata collected in Mainit Hot Spring Protected Landscape, Nabunturan, Compostela Valley, Philippines.

Odonata from Mainit Hot Spring Protected Landscape, Nabunturan, Compostela Valley, Midanao, Philippines [distribution of species (O: oriental, P: Philippine, G: Greater Mindanao, M: Mindnao, E: Eastern Mindanao)]

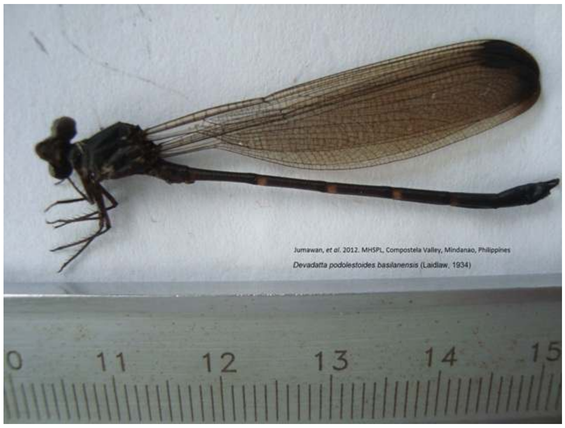

Jumawan, *et al.* 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Devadatta podolestoides basilanensis (Laidlaw, 1934)
0
11
12
13
14
15

Fig. 4 (male) *Devadatta podolestoides basilanensis* (Laidlaw, 1934) 2m, 1m (21.1.2012) [G]
Zygoptera: **AMPHIPTERYGIDAE**

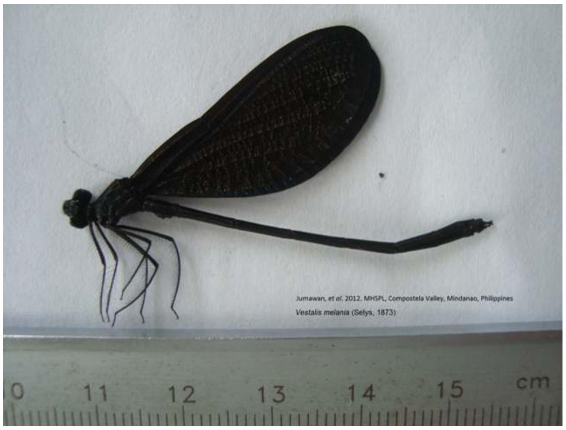

Jumawan, *et al.* 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Vestalis melania (Selys, 1873)
0
11
12
13
14
15
cm

Fig. 5 (male) *Vestalis melania* (Selys, 1873) 1m, 2f (21.1.2012) [P]
Zygoptera: **CALOPTERYGIDAE**

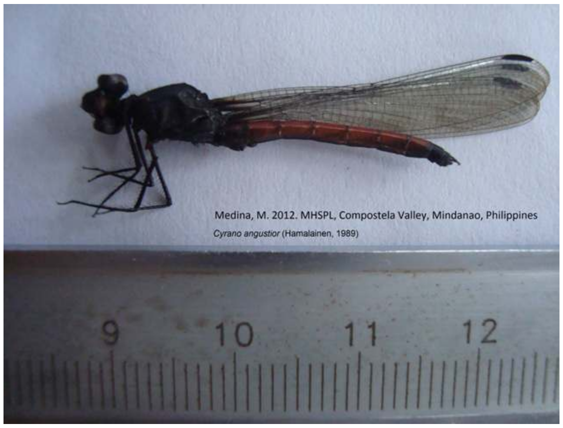

Medina, M. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Cyrano angustior (Hamalainen, 1989)
9
10
11
12

Fig. 6 (male) *Cyrano angustior* (Hamalainen, 1989) 1m (21.1.2012) [G] Zygoptera: **CHLOROCYPHIDAE**

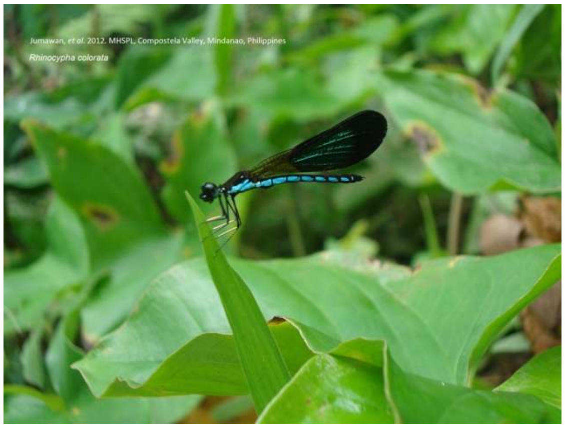

Jumawan, *et al.* 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Rhinocypha colorata

Fig. 7 (male) *Rhinocypha colorata* (Hagen in Selys, 1869) 1m [P] Zygoptera: **CHLOROCIPHYDAE**

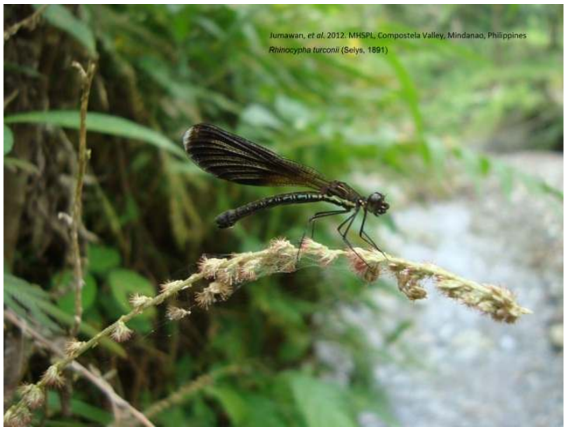

Jumawan, *et al.* 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Rhinocypha turconii (Selys, 1891)

Fig. 8 (female) *Rhinocypha colorata* (Hagen in Selys, 1869) 1f [P] Zygoptera: **CHLOROCIPHYDAE**

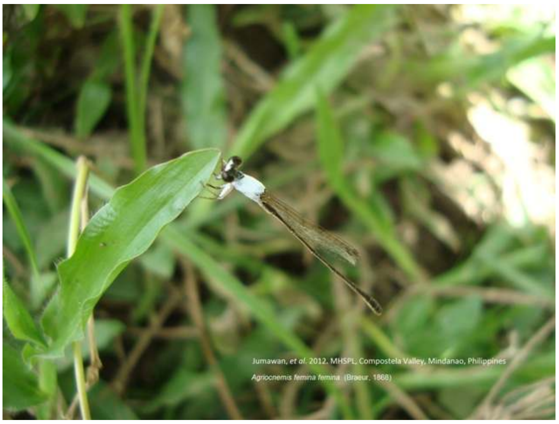
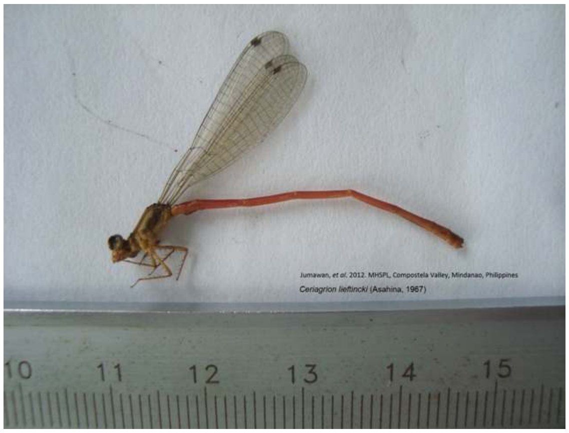

Jumawan, *et al.* 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Agriocnemis femina femina (Braeur, 1868)

Fig. 9 (female) *Agriocnemis femina femina* (Braeur, 1868) 4m 1f [O] Zygoptera: **COENAGRIONIDAE**


Jumawan, *et al.* 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Ceriagrion lieftincki (Asahina, 1967)
10
11
12
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14
15

Fig. 10 (male) *Ceriagrion lieftincki* (Asahina, 1967) 1m, 1f [P] Zygoptera: **COENAGRIONIDAE**

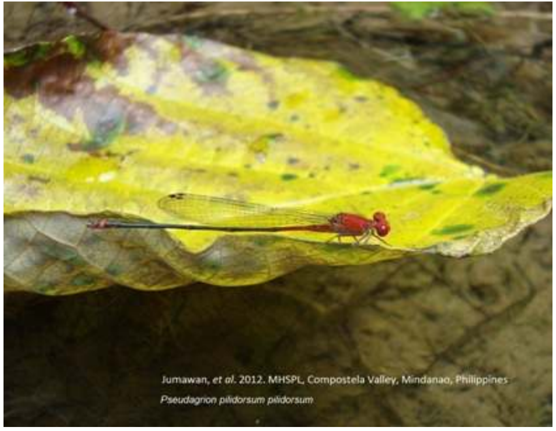
Jumawan, *et al.* 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Pseudagrion pilidorsum pilidorsum

Fig. 11 (male) *Pseudagrion pilidorsum pilidorsum* 1m [O] Zygoptera: **COENAGRIONIDAE**

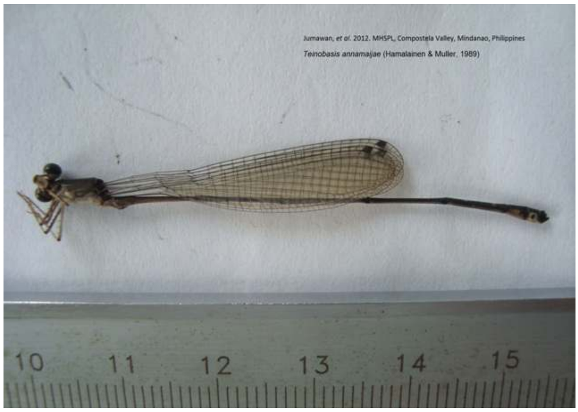
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Teinobasis annamaijae (Hamalainen & Muller, 1989)
10
11
12
13
14
15

Fig. 12 (male) *Teinobasis annamaijae* (Hamalainen & Muller, 1989) 1m [M]
Zygoptera: **COENAGRIONIDAE**

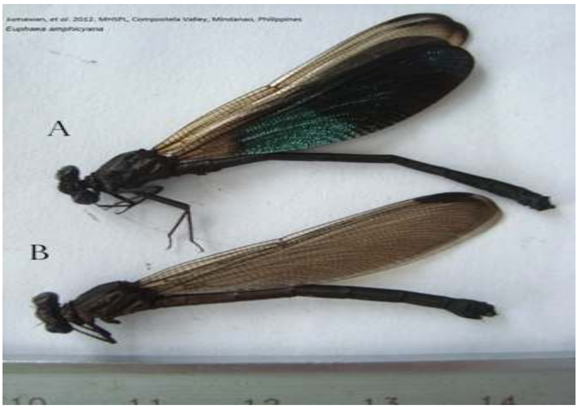
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Euphaea amphicyana
A
B

Fig. 13 A (male) B (female) *Euphaea amphicyana* (Ris, 1930) 4m, 1m (21.1.2012) [G]
Zygoptera: **EUPHAEIDAE**

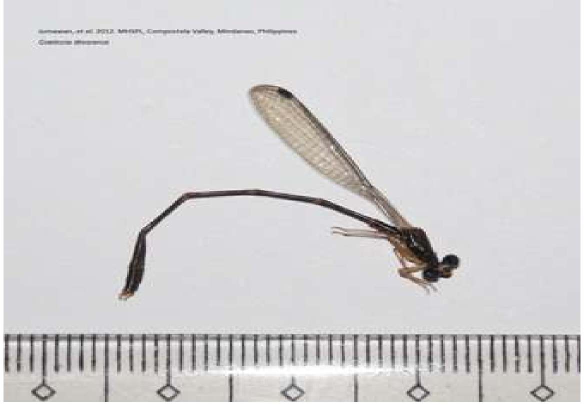

Fig. 14 (male) *Drepanosticta* sp. 1m, 1m(21.1.2012) [M]
Zygoptera: **PLATYSTICTIDAE**

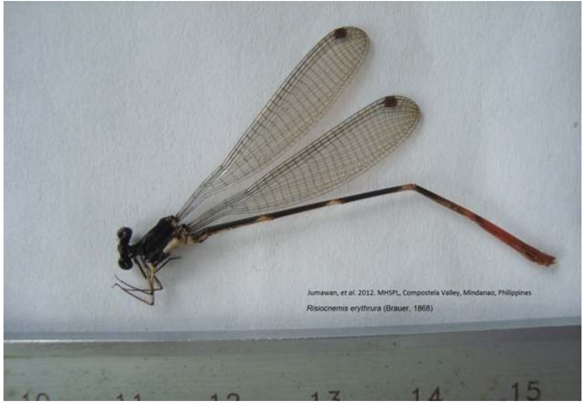
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Risiocnemis erythrura (Brauer, 1868)
14
15

Fig. 15 (male) *Risiocnemis erythrura* (Brauer, 1868) 1m, [M]
Zygoptera: **PLATYCNEMIDIDAE**

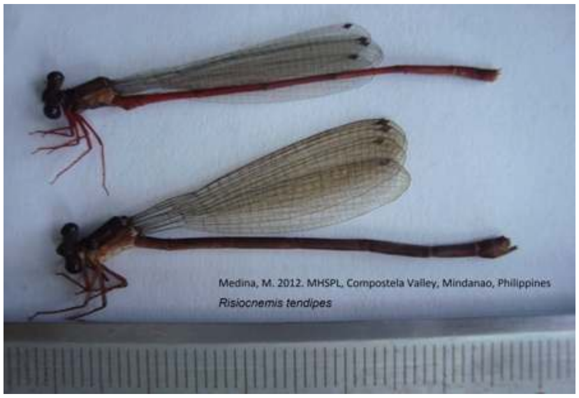
Medina, M. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Risiocnemis tendipes

Fig. 16. A (male) B (female) *Risiocnemis tendipes* Needham & Gyger, 1939 1m, 3m (21.1. 2012) [M]
Zygoptera: **PLATYCNEMIDIDAE**

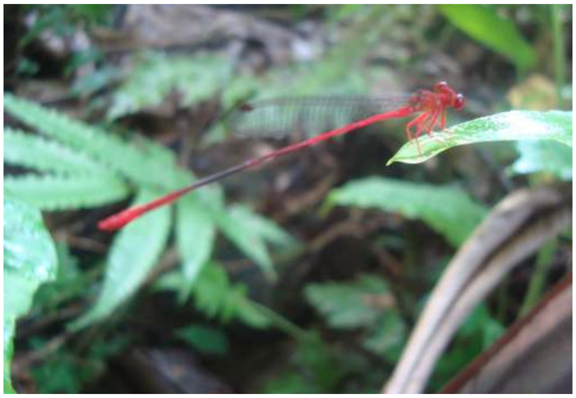

Fig. 17 (male) *Risiocnemis flammea* (Selys, 1882) 1m, 1m (21.1.2012) [G]
Zygoptera: **PLATYCNEMIDIDAE**

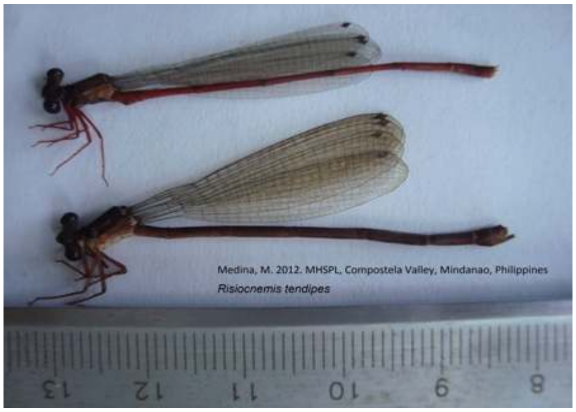
Medina, M. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Risiocnemis tendipes

Fig. 18 A (male) B (female) *Risiocnemis fuligifrons* Hamalainen, 1991 3m [G}
Zygoptera: **PLATYCNEMIDIDAE**

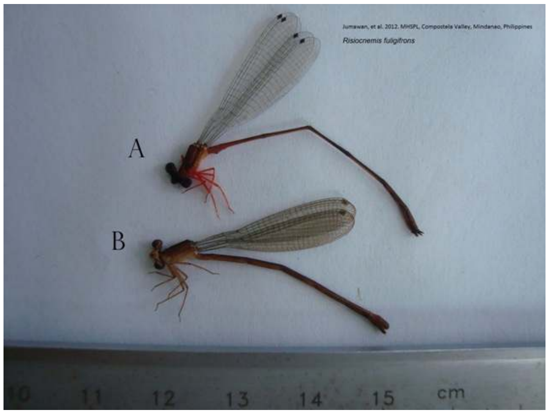
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Risiocnemis fuligifrons
A
B
cm

Fig. 19 A (male) B (female) *Risiocnemis tendipes* Needham & Gyger, 1939 3m, 6m (21.1.2012) [M]
Zygoptera: **PLATYCNEMIDIDAE**

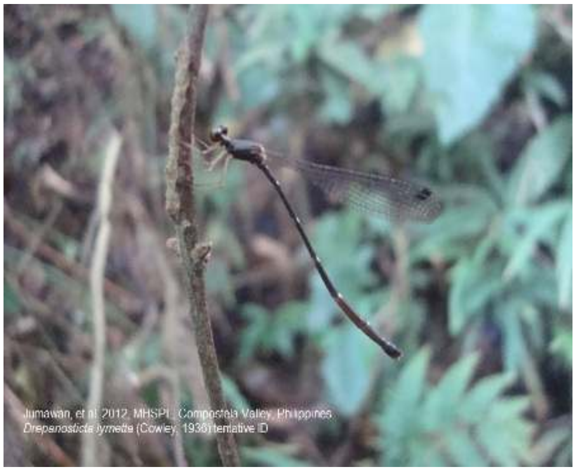
Jumawan, et al. 2012. MHSPL, Compostela Valley, Philippines
Drepanosticta lymetta (Cowley, 1936) tentative ID

Fig. 20 (female) *Drepanosticta lymetta* (Cowley, 1936) 3m 1f, 12m 3f (21.i.2012)[E]
Zygoptera: **PLATYCNEMIDIDAE**

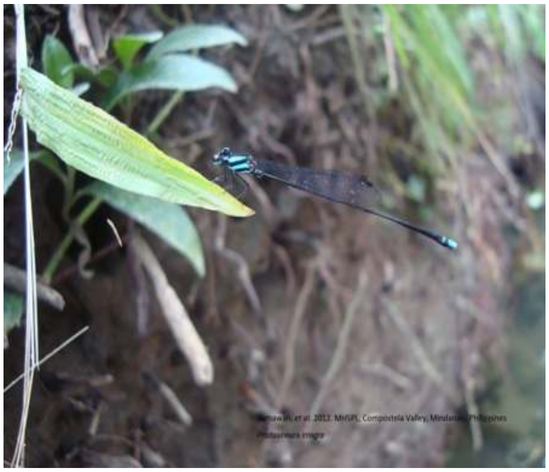
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines

Fig. 21 (male) *Prodasineura integra* (Selys, 1882)1m [P]
Zygoptera: **PROTONEURIDAE**

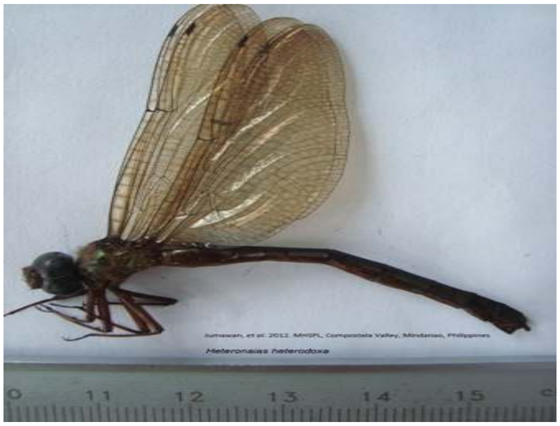
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Heteronaias heterodoxa

Fig. 22 (female) *Heteronaias heterodoxa* (Selys, 1878)1f, 1f(21.1.2012) [P]
Anisoptera: **CORDULIIDAE**

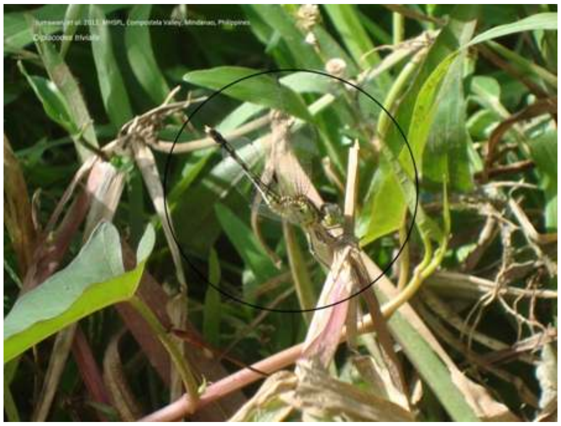

Fig. 23 (female) *Diplacodes trivialis* Rambur, 1842 1m [O]
Anisoptera: **LIBELLULIDAE**

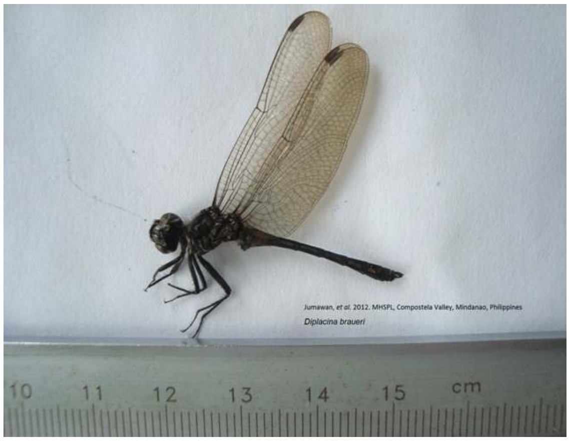
Jumawan, *et al.* 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Diplacina braueri
10
11
12
13
14
15
cm

Fig. 24 (male) *Diplacina braueri* Selys, 1882 2m [P]
Anisoptera: **LIBELLULIDAE**

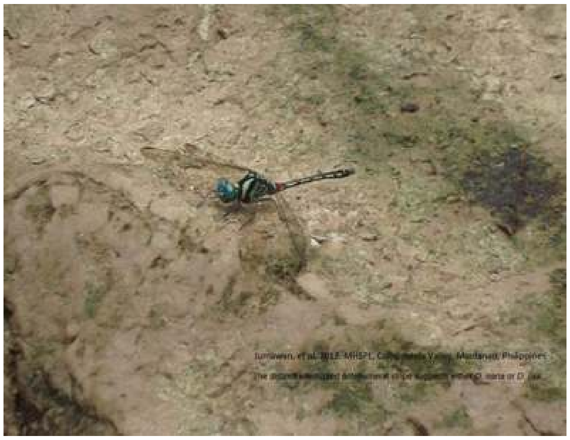
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines

Fig. 25 (male) *Diplacina sp*. Anisoptera: **LIBELLULIDAE**. This species is usually seen resting in moist areas looking for mate or prey; Photographed 21.12.2011. The distinct interrupted antehumeral stripe suggests either *D. nana* or *D. lisa*.

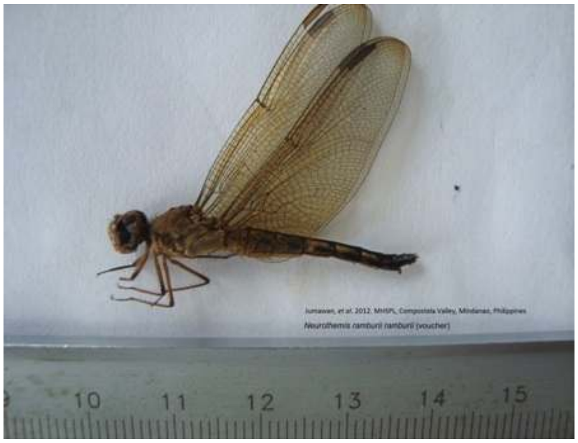
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Neurothemis ramburii ramburii (voucher)
10
11
12
13
14
15

Fig. 26 (female) *Neurothemis ramburii ramburii* Brauer, 1866 2m, 1m (21.1.2012) [O]
Anisoptera: **LIBELLULIDAE**

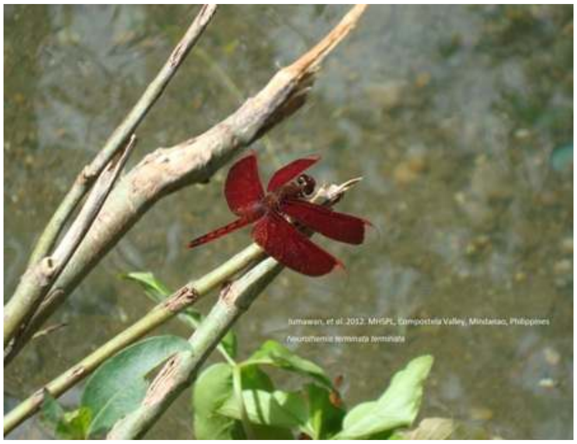
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Neurothemis terminata terminata

Fig. 27 (male) *Diplacina braueri* Selys, 1882 2m [P] Anisoptera: **LIBELLULIDAE**

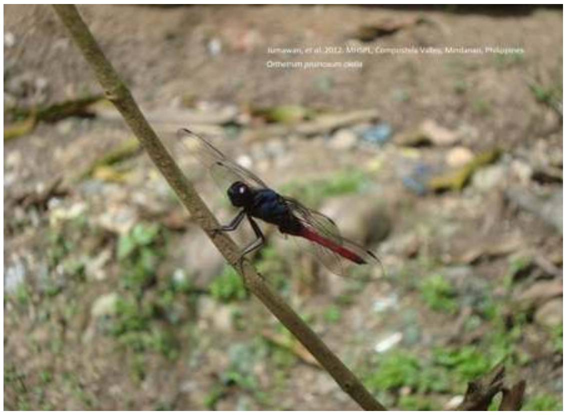
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Orthetrum pruinosum clelia

Fig. 28 (male) *Orthetrum pruinosum clelia* Selys, 1878 2m 1f, 2m(21.1.2012)
Anisoptera: **LIBELLULIDAE**

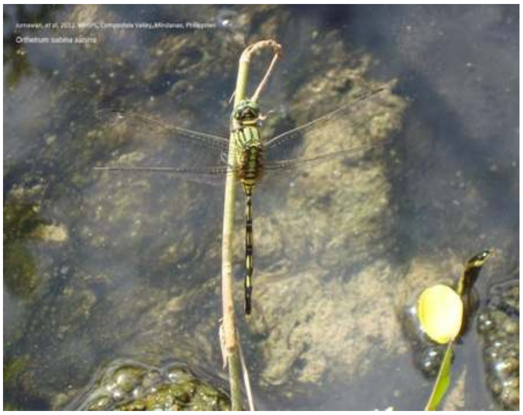
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Orthetrum sabina sabina

Fig. 29 (male) *Orthetrum sabina sabina* Drury, 1773 (1/21/2012)[O]
Anisoptera: **LIBELLULIDAE**

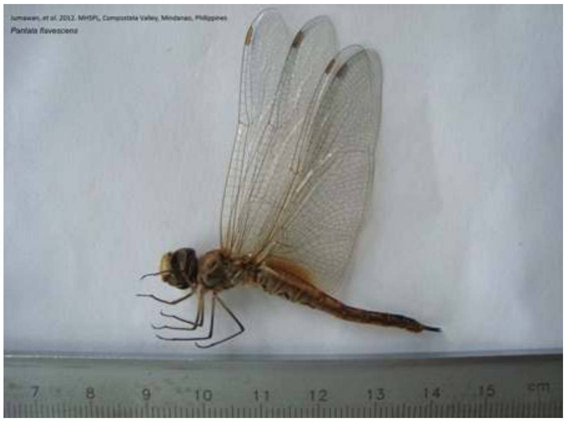
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Pantala flavescens
7
8
9
10
11
12
13
14
15
cm

Fig. 30 (female) *Pantala flavescens* Fabricius, 1798 1m
[CIRCUMTROPICAL]
Anisoptera: **LIBELLULIDAE**

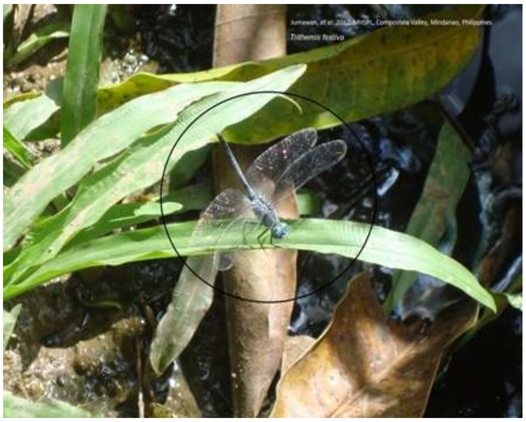
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Trithemis festiva

Fig. 31 (male) *Diplacodes trivialis* Rambur, 1842 1m [O]
Anisoptera: **LIBELLULIDAE**

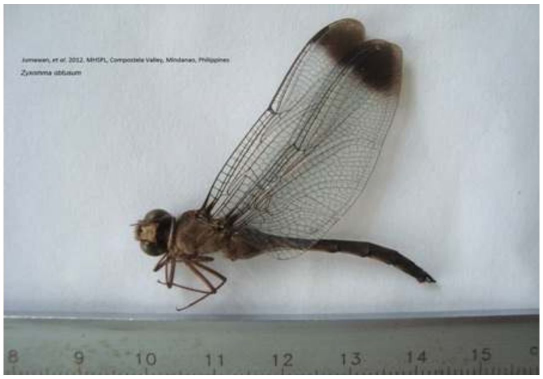
Jumawan, et al. 2012. MHSPL, Compostela Valley, Mindanao, Philippines
Zyxomma obtusum
8
9
10
11
12
13
14
15

Fig. 32 (male) *Zyxomma obtusum* Albarda, 1881 [O]
Anisoptera: **LIBELLULIDAE**